DOCUMENT RESUME

ED 231 504 PS 013 566

AUTHOR Bowman, Barbara T.
TITLE Do Computers Have a Place in Preschools.
PUB DATE 25 Feb 83
NOTE 15p.; Paper presented at the Meeting of the New Mexico Association for the Education of Young Children (Albuquerque, NM, February 25, 1983).
PUB TYPE Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comprehension; *Computer Literacy; *Computers; Early Childhood Education; *Educational Innovation; *Educational Needs; *Metacognition; *Microcomputers; Teacher Role; *Young Children
IDENTIFIERS LOGO System; Papert (Seymour)

ABSTRACT

There is reason to doubt that computers are currently revolutionizing schools, for few advances have been made in how lessons are either organized or presented. Until recently, most of the early childhood community had considered computers to be too impersonal for young children and too time consuming for teachers. That view has changed somewhat due to fairly recent advances in use that indicate computers can be employed by children to teach themselves. As a result, many schools now routinely provide upper elementary grade-school students the opportunity to "play" with computers. Advocates of the use of computers in schools make four points crucial to planning their educational uses: (1) to interact, computer and child must have a common language; (2) to engage the computer, the child must learn to think the way computers think; (3) children must have a problem-solving attitude that emphasizes creativity and experimentation; and (4) teachers introducing children to computers must themselves have an interactive relationship with computers. An elaboration of these four points suggests implications for early childhood education; additionally, to insure that children are ready to join the computer revolution, emphasis on play, problem solving and self-directed learning must continue; investigations must go forward to initiate computer literacy, and social inequalities deepened by the computer age must be addressed. (RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED231504

Address for

NEW MEXICO ASSOCIATION FOR THE EDUCATION OF YOUNG CHILDREN

Alburquerque, New Mexico

February 25, 1983

Barbara T. Bowman

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☒ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Barbara T. Bowman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

DO COMPUTER'S HAVE A PLACE IN PRESCHOOLS

In case you haven't heard: there is a revolution abroad, a computer revolution.

The New York Times on January 4, 1983 said, "the personal computer revolution is in full force throughout the school systems of our land." Newsweek Magazine in the December 28, 1982 issue calls it "The Great Computer Frenzy" and comments "There was a time when parents who wanted an educational present for their children would buy a typewriter, a globe or an encyclopedia set. Now those items seem hopelessly old-fashioned; this Christmas, there will be a lot of personal computers under the tree. Convinced that computers are the key to success, parents are frantically insisting that children be taught to use them as early as possible."

PS013566

Parents, teachers, and school administrators are now caught up in this rising computer hysteria; a hysteria that is understandable only if one recognizes that it comes from a very real concern with our technological future, a concern that the United States continue to maintain it's current economic and political preeminence in the world community. Not since the Russians sent off Sputnik has the American public been so anxious about the education of children, particularly their technological education.

Many of us might wish that this periodic educational hysteria would pace itself more evenly through the years so that we could get our communities to talk about and pay for good education every year not just when we feel challenged by the Russians or

Conf paper

the Japanese. Many of us might wish that those concerned with computers and technology would recognize that people issues are part and parcel of the technological ones and that the computer revolution must encompass issues of poverty and prejudice, of the quality of interpersonal relationships and personal fulfillment as well as the size of random access memory and the number of disc drives. But in spite of such caveats, all of us who work with children can all be pleased and excited that we have a new and fascinating challenge...computers.

Karen Sheingold has commented that a piece of equipment does not make a revolution. ("Study of Issues Related to Implementation of Computer Technology in Schools." pp. 3) And, indeed, it is altogether possible, if not desirable, for the computer revolution to happen in the society and leave the school behind. It has happened before. Audiovisual technology is a case in point. Although television is a overwhelming influence in children's out-of-school lives, video technology has not had a similar impact on education in schools. For the most part, TV has not had a significant effect on instructional content or teaching strategies.

Certainly there is some reason to doubt that computers are currently revolutionizing schools. Today, for the most part, computers are only being used in school to provide children with traditional opportunities to practice skills and test their knowledge. Much of the computer assisted instruction (CAI) using either teacher programmed or purchased software, does no more than permit children to move at their own speed through standardized curriculum units. The term electronic worksheets has been used to characterize this way of using computers and there is generally little new in either how lessons are organized or presented.

Why have computers made so little difference to schools? Some contend that schools are too rigid to accomodate to a new technology. They contend that schools' social structure, its belief system and its relationship to the larger society keep them reactionary institutions, unable to absorb or adapt to new ideas. Others contend that

schools are essentially socializing institutions and that teachers, not the precise curriculum or the hardware of teaching, are the important components of learning. Those ascribing to this position often view technology as dehumanizing, depersonalizing, and while the usefulness of computers to society is recognized, they believe that in education computers are simply gimmicks that cannot and should not take the place of a good teacher and, therefore, have only a peripheral role to play in schools.

Until a few years ago the argument about computer use in school left me only a marginally interested bystander since I was convinced that whether they were useful to elementary or secondary teachers or not, they certainly had no place in the preschool or with young children. Mechanical instruction first came to the attention of the early childhood community 15 years years ago when O.K. Moore's talking typewriter and the Language Master (two kinds of teaching machines) were introduced into preschool programs, particularly Head Start programs, where they were supposed to help children learn to read. Neither of these machines gained much popularity since programming them required large amounts of teacher time without clear evidence that children learned better or more rapidly as a consequence of them.

It was the judgment of most of the early childhood community that computers are too impersonal for young children and too time consuming for the teachers. There was little reason for those who work with children between 3 and 7 to be concerned about the computer revolution, they could safely leave computers to teachers of older children.

This continued to be my position until a few years ago when I became interested in computers myself and discovered the fascination of learning to solve problems with one. The real change in my position in regard to computer use for young children came after reading the work of Seymour Papert, particularly a book entitled Mindstorms. Papert's central thesis is not that computers can make our lives easier by doing complex tasks fast and with a high degree of accuracy. He's not terribly impressed that computers can be used to make games, or to do the income tax, or send out volumes of third class mail

from mailing lists or even to pay our bills. For him the excitement of computers is that when used correctly they may affect the way people think and learn. He makes a distinction between using computers to solve problems we already know how to solve and using computers to think with; he makes a difference between active and passive use. When the computer is used to practice skills and acquire information preprogrammed into it, the user is essentially passive to the programmer no matter how much fun or how challenging the program may be. Papert is suggesting something different. He is suggesting an active or interactive relationship with the computer, one in which the user and the computer work together to solve personally interesting and significant problems.

To use computers in this way we need an entirely different orientation than is necessary when we follow preprogrammed instructions or when we use the computer as an adding machine to perform operations we know how to do but can be done much faster on the computer than with pencil and paper. Papert recommends that children become controllers of the machine rather than being controlled by it, that the computer be used to stimulate children's thinking. For me at least, this was a revolutionary idea. No longer did I think of computers as an inadequate substitute for a good teacher but I could see that the computer itself could be the instrument by which children could teach themselves. For those of us in early childhood education where Piaget's ideas have been so influential, such a orientation toward learning was understandable and exciting. When Papert writes that his model of children's learning is one in which children are builders of their own intellectual structures, he finds immediate resonance in the early childhood education community.

Papert's book also described a computer language that is simple enough for very young children to master but one which is powerful enough to enable children to address important mathematical ideas. LOGO, or the Turtle language, requires the child to learn a few simple commands and then he or she is able to create graphics. Papert writes that children working with LOGO are "learning a language for talking about shapes and fluxes

of shapes, about velocities and rate of change, about processes and procedures. They are learning to speak mathematics, and acquiring a new image of themselves as mathematicians."

I'm pleased to say that as the consequence of the work of Papert and his group at M.I.T. and of other projects advocating interactive computer use for elementary grade children, many schools are routinely providing children between 7-12 the opportunity to 'play' with computers, and in many homes, personal computers are regularly used by children to forward their own interests. It is expected that over the next generation some children will become so much at ease with the computer, its technology and capabilities, that both their quality and direction of the education will be altered. For such children, the capacity to process information will increase exponentially and the way in which they think about probelms will be substantially changed. Other children will not be so lucky. Because of limited opportunity to use computers for their own purposes, because of teachers who either do not understand or do not value interactive computer use, because of parents and communities who do not understand the importance of learning to think as opposed to learning other people's thinking, some children's computer education will be sharply limited unless we see the danger and respond to it quickly.

While reading Papert's ideas, I was tremendously pleased to find a computer expert, a scientist, a mathematician who understood the structure of mathematics and who could relate this to the development of children and the potential of computers to teach. Two years ago I began my own personal odessey exploring what young children and their teachers can or should be doing to prepare themselves for the computer revolution.

Papert and other computer protagonist make 4 points which are essential to us in considering early interactive computer education. First, they contend that in order to interact with the computer the child and the computer must have a common language. Secondly, they note that in order to engage the computer the child must learn to think

the way computers think...they must be able to organize the problem in a way that computers can address them. Thirdly, they believe that children must have a 'problem solving' attitude which emphasizes creativity and experimentation rather than convergent thinking and rote learning. And finally, teachers who introduce children to this interactive relationship with computers must have it themselves. As Papert says, interactive computer use must make sense to adults too. He says "A dignified mathematics for children cannot be something we permit ourselves to inflict on children, like unpleasant medicine, although we see no reason to take it ourselves." (p.54)

I'd like to elaborate on these 4 points since I think they are crucial to our planning for young children.

1. Interacting with computers involves learning to speak a new language. Computers have certain capabilities preset in their memory and by combining these capabilities, vastly complicated operations can be performed. Although I now have a rudimentary understanding of how computers work, I'm still incredulous that a machine that can only do two things, go on and go off, that such a machine can also be made to play music, create moving pictures, translate numbers into graphics, automatically derive the standard deviation of a string of numbers or find the distance to the moon. Perhaps some of us are fated to retain our atavistic beliefs despite the weight of modern science. Mine is that the same little person who accounts for why electric lights go on and off is also inside my computer. Despite my fantasies, or perhaps because of them, learning to talk to my computer has been similar to learning a foreign language. On occasion I have been particularly irritated that the little person in the computer requires me to tell him the same thing in different ways depending on what machine or program he is currently in. My IBM tells me its listening to me in

Basic with an OK, but in DOS it says it's listening with an A; in LOGO I have to tell the machine not to draw right away but in Basic it won't do anything until I tell it to "run". It is frustrating to watch young children make almost instantaneous language adaptation to various machines and programs. I am reminded of a similar frustration when my daughter was growing up trilingual in Iran and I was struggling to remember that in French the verb must change gender but that in Pharsi I would make no such ending changes. Certainly we have good reason to suppose that the years between 4 and 7 or 8 are exceptionally good times to expose children to new languages. It is a time of intuitive language rule making and results in learning that is certainly superior to the more grammar-oriented approach so familiar to adults trying to learn a new language. Early childhood is a period when language is acquired with relative ease and without the need for extensive formal instruction. From what we know about development of children, it seems likely that children might well be exposed to the language of computers during the preschool and early school years. It also seems likely that they will learn the computer language best by observing and interacting rather than by didactic instruction...just as they do other languages. What seems to be needed is an opportunity to interact with computers in order for the structure of the language to become clear. Later experience can expand the vocabulary and extend the ideas that are to be expressed just as they do for the mother tongue. Our task as teachers of young children is to awaken in children interest in communicating with the computers and to provide opportunities for informal but responsive interactions between children and the computer. LOGO is a language that goes a long way toward

meeting our requirements for 5 to 8 year olds. We undoubtedly need some even simplier form for younger children, however; perhaps a form that can respond to children's verbal communcations as opposed to written ones.

2. Engaging the computer to help solve problems requires a particular way of organizing the problem. Not only does one need to learn to speak a computer's language, one must speak in the forms that computers can understand.

The way in which computers are most different from humans is that they need to have each aspect of the problem clearly and unambiguously stated. While doing something oneself, one can make minor adjustments as needed; when communicating with another human being one can send non verbal clues or speak in short hand. The computer is unfortunately dumb and must be told every single thing that you want it to do. This is particulalry difficult for young children who can frequently do something themselves but cannot tell you clearly how they did it. How one thinks about thinking is called metacognitive thinking. If it is an essential skill for programming computers to be able to break down and analyze the steps in solving a problem, certainly young children will need more practice at this activity than is sometimes allocated during the early school years. We may well need to spend more time on flow charts and matrix boards (important activities for helping children see the relationship of parts of the problem to the whole and of making sure that all of the parts are adequately planned) rather than on rote counting and labeling shapes and colors. Similarly discussions of how block building are built, pictures created and stories written would seem to be important preparation for children of the computer age.

3. Developing a problem solving attitude. Operating computers is not difficult. Children and adults alike can quite easily be taught to turn the machine on and follow standard procedures. All of us observe such use of computers daily in the bank, at airline ticket counters, at the supermarket, in game arcades. These uses of computers are making all of our lives easier and more efficient and it requires little training in order to operate them.

But this is not what we mean when we speak of the educational use of computers. What we have in mind then is using the computer as an extension of thinking, as a tool which permits the human to build models of problems which can then be solved. A simple example: Two six year olds are arguing about how many blocks each needs in order to make a block building. There are two ways to solve the problem. Each can keep building until his structure is complete and then count the blocks each used. Or each can draw the building of his dream on the screen and let the computer figure out how many blocks are needed by each. This is an example of model building, that is cutting the problem down in size so that it is possible to look at it in miniature or in its essential configuration. The gradual understanding of the relationship of concrete experience to models and symbols is one of the important developmental tasks of the child between 3 and 8.

LOGO graphics provide a bridge, a representation of real life forms, with which children can work in solving problems and from which they can begin to derive mathematical principles. This kind of understanding permits children to make sense of formal academics; without this kind of understanding academics become disconnected facts to be memorized because they make so little sense. Children

who are not problem solvers find little use for much of what is taught in school, and when they grow up they may know their time tables and yet find no relationship between those tables and comparison shopping at the supermarket. It is this balance between what is known and why it needs to be known that permits learners to apply their knowledge. Unfortunately, school tends to focus almost exclusively on what to know. This tendency to emphasize content has been reinforced recently by a legitmate concern that children master the basic skills. But content without understanding should not be our goal for then knowledge is no more than information, unavailable to think with, to create with. The push to limit education to rote learned basic skills must be resisted most strongly during the preschool and primary grades when children should be enlarging and expanding their capacity for thinking. Piaget's work on the development of cognition in children provides support for Papert's contention that playful problem solving activities are an essential component to effective computer use. As teachers of young children, we are in a particularly important position. We must speak out against the effort to make basic skills education no more than memory learning. At its best, basic skill education should include both problem solving skills and information facts and the computer can be a powerful tool in helping children learn both.

4. Teachers must develop appropriate attitudes and skills if they are to be effective leaders for children.

If computers are to change the education of children, teachers must be responsible for making them a facilitating tool.

Teachers of young children should have less difficulty with some aspects of teaching computer literacy than other teachers. We are already aware of and deeply committed to the notion of children learning to learn, to children's needs to explore their world without undue emphasis on right or wrong answers, to the value of play and collaborative activities, to the facilitating rather than directive role of the teacher. These are essential principles for teacher's who will teach children to interact with computers. There is some bad news, however. Most teachers have little appreciation for the creative possibilities of the computer. Many of us are math phobic and resist the suggestion of helping children discover mathematical functions and problem-solving strategies with computers. Recently at the Erikson Institute I have been involved in a study of preschool teachers' mathematics knowledge and understanding of how they teach mathematics to the children. (This study was conducted in collaboration with Lucinda Lee Katz and Gillian McNamee at Erikson Institute and funded by two farsighted technologically oriented corporations, IBM and Xerox). As part of the study we surveyed the teachers expectations for children's achievement and their own attitudes about mathematics. As you might expect, we varified the common perception of teachers of young children as being unsure of their own math ability, as having conservative expectations of the children (that is, they focus heavily on number facts and labels), and as

having limited understanding of how young children develop mathematical knowledge. These characteristics are not ones that will serve us best if we are to help young children become more competent in mathematics and science. It seems clear that we as teachers are going to have to demand and participate in in-service training programs that teach us math and which encourage in us the same problem solving enthusiasm we expect to awaken in children. For those of you who are fearful that you will not be an instant expert, the further good news is that you don't have to be. Cooperation between teachers and children in solving a problem is good for both teacher and child for it teaches the child and reminds the adult that the problem solving is, or should be, a life long activity.

What should we do to insure that our children are ready to join the computer revolution? I suggest 3 things:

1. We need to continue to work hard to see that parents, administrators, and the community at large, understand and support the emphasis on play, on problem-solving, on self-directed learning, on cooperation in learning that are so central to the traditions of early childhood education. We must resist even more strenuously the efforts to down grade curriculum so that preschool, kindergarten and first grade are no more than factories dedicated to stamping out little rote learners of letters and numbers and colors and size labels.
2. We must investigate how to initiate computer literacy. Should we introduce the computer to the preschool child or should we wait until the child is older to give him experience programming computers? Although it is clear that most four year old children

can learn the mechanics of simple programming in LOGO, it is not presently clear that the preschool years are the best or ideal time to introduce the computer itself. Indeed, the analogy may be made to reading where the best instruction during the preschool years is not to teach reading itself but instead to improve children's mastery of oral language, to encourage positive attitudes about self, to motivate the child toward formal learning and to provide other language experiences supportive of later reading. It may well be that direct computer use is less important than some types of precomputer experiences: games that necessitate thinking about how to solve a problem, games to practice giving directions, games that encourage thinking of alternative solutions to problems.

3. We must be alert for the inequalities in our society that are being deepened as we move into the computer age. We must be concerned about poor children who have limited opportunity to use computers in creative and personally interesting ways. The benefits of early and frequent computer exploration is usually denied to children from poor families. Cut off from early and playful use of computers, attending schools that emphasize basic skills, supported by parents and teachers who value conformity, rote learning and individual work, poor children's problem solving education may be seriously deficient and their futures with computers will be seriously compromised. The perpetration of the underclass will be guaranteed if the only knowledge that poor children and their parents have of computers is as electronic flash cards, as hand/eye coordination games, or as prestructured puzzles...as passive users of other's thinking.

There are many interesting and challenging questions confronting those of us in early childhood education. How and when should children be exposed to computer programming experiences, do classroom environments need to be restructured to accomodate interactive computer use; what subskills are essential for children to move from one level of understanding to the next; what is gained and lost by changing classrooms to encourage interactive computer use? I am sure that if we will bring to these questions an open mind, a willingness to learn ourselves, computers will achieve their promise and early childhood education can join the revolution.

BTB/sp